FIVE YEAR REVIEW
MASTER DISPOSAL SERVICE LANDFILL
BROOKFIELD, WISCONSIN

SEPTEMBER 2000

I. INTRODUCTION

A. Authority and Purpose

The United States Environmental Protection Agency (U.S. EPA), Region 5, conducted this statutory five-year review under Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and NCP Section 300.430(f)(ii). The Statute and the regulations require that periodic reviews (no less than every 5 years) are to be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that will not allow for unlimited use or unrestricted exposure following implementation of remedial actions for the site. The purpose of this five-year review is to evaluate whether a completed remedial action remains protective of human health and the environment, and is functioning as designed at the Master Disposal Service Landfill Superfund Site, located in Brookfield, Wisconsin ("the Site").

The U.S. EPA has established a three-level approach to conducting five-year reviews; these are Level I (and a sub-level Ia), II and III. The level Ia provides the most basic of which provides a minimum protectiveness evaluation for sites with on-going response actions. U.S. EPA contemplates that a Level I review will be appropriate in all but relatively few cases where site-specific considerations suggest otherwise. The second and third levels) (Levels II and III) of review are intended to provide flexibility to respond to site-specific considerations, employing further analysis. Site-specific considerations, including the nature of the response actions, the status of the on-site response activities, and the proximity to populated areas and sensitive environmental areas determine the level of review for a given site. The Level Ia review conducted for this Site is applicable because the response action is on-going. This review will be placed in the Site files at U.S. EPA Region 5, Chicago, Illinois, and at the Site repository which is located at the Brookfield Public Library, 1900 Calhoun Road, Brookfield, Wisconsin 53005.

B. Site History

I. Background

The Site is an inactive industrial landfill in the town of Brookfield, Waukesha County, Wisconsin. (See Site & Location Maps, Figures 1.1 and 1.2.) The Site is located at 1990 West Capitol Drive (Wisconsin Route 190). The Site occupies about 40 acres of land, of which 26 acres of land comprise a now inoperative landfill. During the fall of 1966, the Site was purchased by Master Disposal Incorporated and began its operation as Master Disposal Service Landfill. The Site lies within the marshy flood plain of the Fox River and is partially surrounded by wetlands and drainage channels. Land filling operations have created a plateau that is confined by perimeter berms surrounded by flat-lying lowlands. The Site lies within a primary

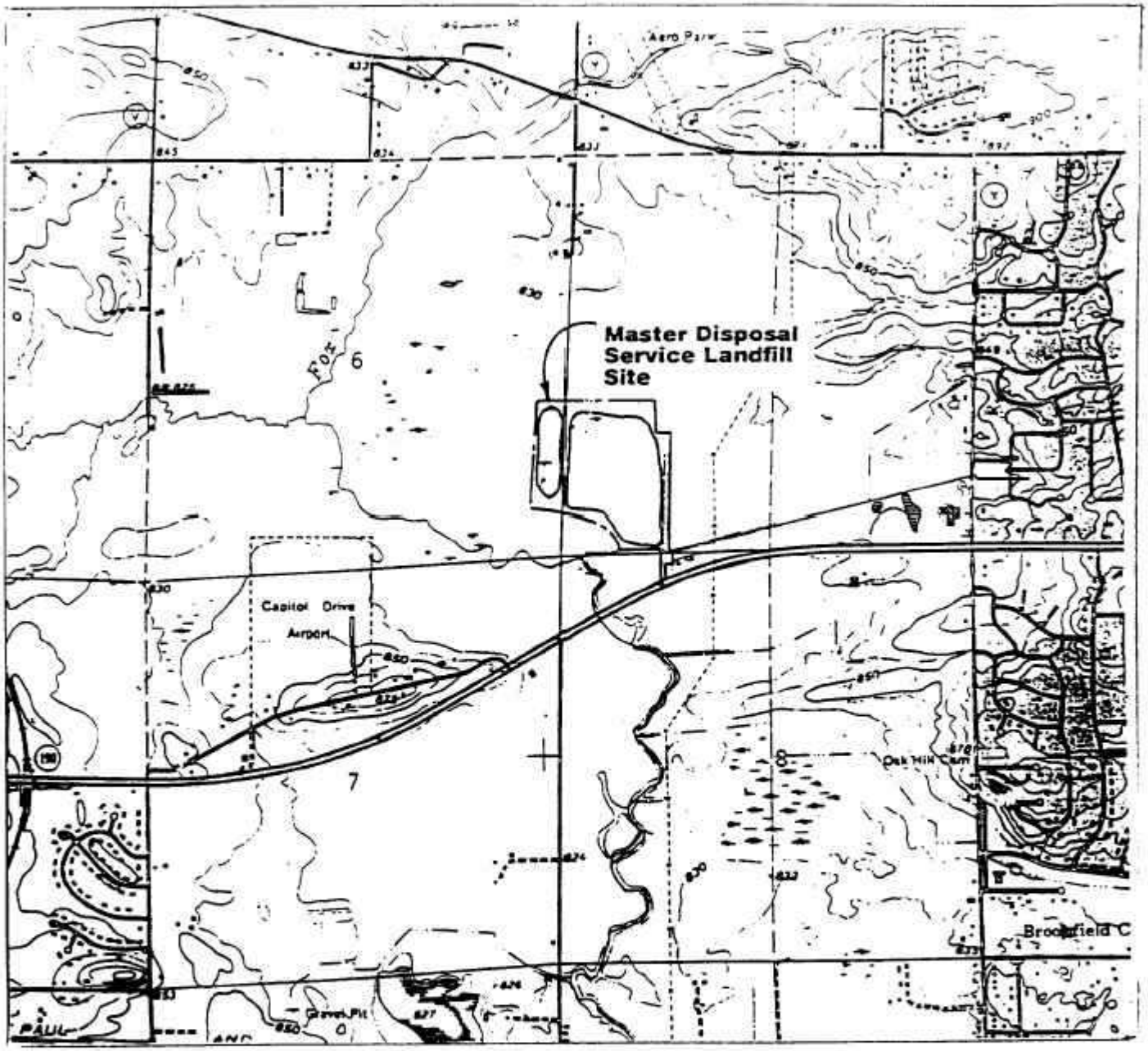

FIGURE 1-1
MDSL Location Map

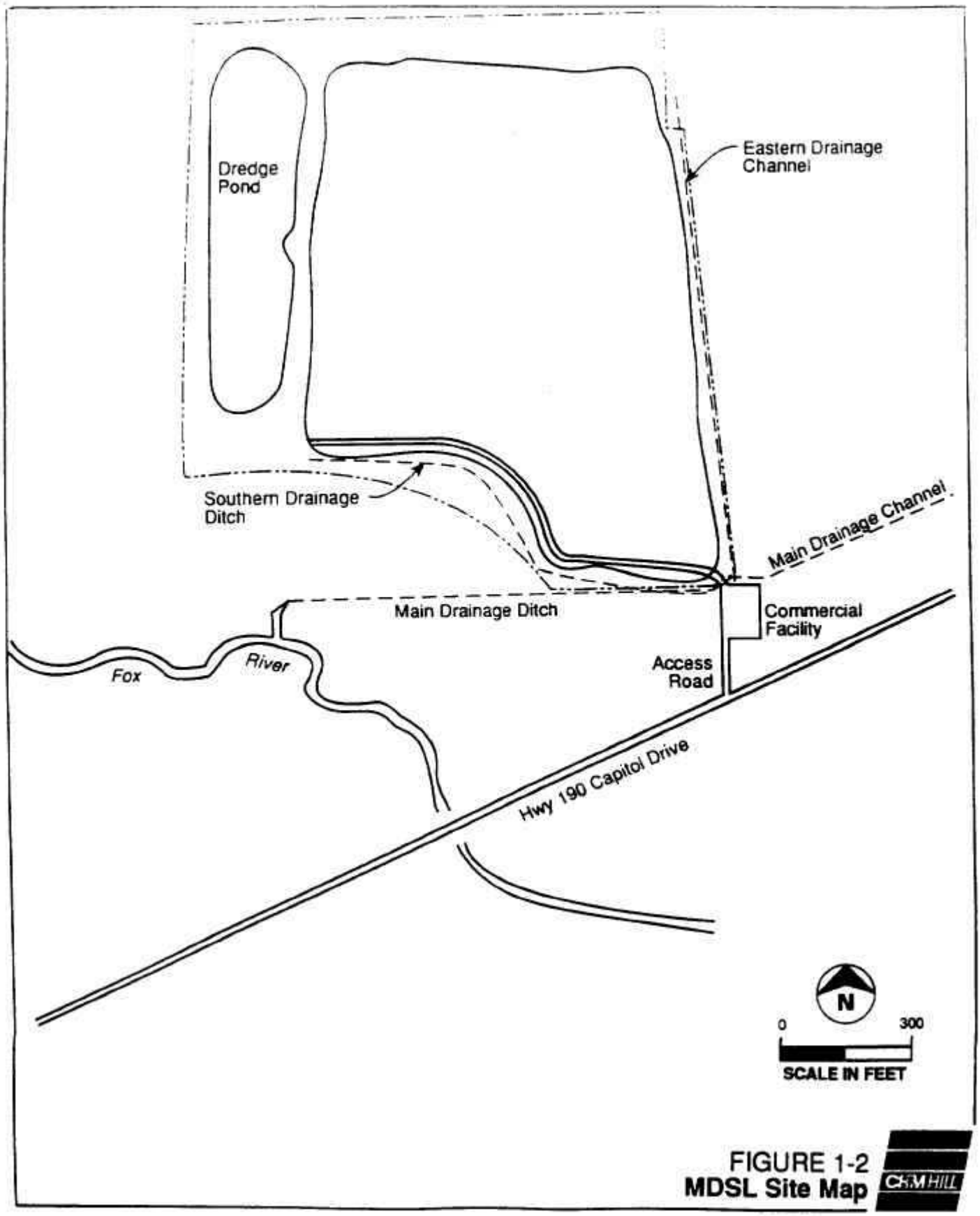

FIGURE 1-2
MDSL Site Map

environmental corridor, as defined by the Southeastern Wisconsin Regional Planning Commission. The Site overlies a surficial sand/gravel and dolomite aquifer system, which has been contaminated by on-site disposal activities. The hydrogeology at and near the Site is discussed it more detail below.

On-site disposal of mainly industrial wastes occurred between 1967 and 1982. Foundry sands and slags comprise the largest single class of items disposed. On-site disposal of hazardous wastes included inks, sludges, and solvents drummed liquids, and solids. The Site was partially closed in 1982, but controlled burning of wood waste continued until 1985. The ash from this operation was disposed on-site. The Site was permanently closed in 1985. Investigations completed in 1990 identified negative impacts on surface water and groundwater from the landfill sources.

On September 8, 1983, the Site was proposed for listing on the National Priorities List (NPL), and was listed on September 21, 1984. The 1990 Record of Decision (ROD), which is discussed in more detail below, addresses source control as a final remedy and management of migration of groundwater as interim remedy. If needed, U.S. EPA planned to address the final restoration of the surficial aquifer system through a subsequent ROD. This is discussed in more detail below.

i. Primary Contaminants of Concern

Based on the June 1990 Remedial Investigation (RI) report and the 1990 ROD, the primary contaminants of concern affecting the soil and groundwater were organic compounds, inorganics compounds, and metals. Specifically, the primary chemicals of concern were identified as arsenic, cadmium, chromium, copper, lead, methylene chloride, 1,1-dichloroethene, trichloroethene, benzene, toluene, and xylene. The results of the groundwater monitoring sampling events reported in the RI report are summarized in Table 1 and Table 2.

ii. Site and Regional Geology and Hydrogeology

The stratigraphy at the Site (underlying the original cover material, landfill debris, and surface sediments) is heterogeneous with alternating clay, silt, and sand lenses.

The nearest residential well is approximately one mile to the south of the Site. Groundwater flow is primarily to the south-southwest and flows toward the Fox River. Within the wetlands surrounding the Site, a substantial amount of peat is encountered.

Groundwater at the Site flows through the following discrete aquifer systems: a shallow aquifer system composed of glacial deposits and dolomite bedrock, and a deeper confined system composed of sandstone. The shallow aquifer system is comprised of the following two aquifer units: the sand and gravel aquifer unit (containing the Al zone and the A2 zone) in the glacial drift; and, the Niagara aquifer unit (referred to as the A3 zone) in the Niagara dolomite. The Maquoketa shale aquitard lies between the Niagara dolomite and the deeper, confined sandstone aquifer.

Table 1
Organic Contaminants Detected in Groundwater Monitoring Wells During Remedial Investigation

Organic Contaminants	Up Gradient Concentration (ug/L)	Down Gradient Concentration (ug/L)	Standard (ug/L)
acetone	76 (deep[1]), 30 (shallow[2]) 13 (intermediate[2]) 14 (intermediate[2])	41 (deep[1]), 26 (deep[2]), 12 (shallow[2]), 24 (shallow[2])	10
benzene	----------	8 (shallow[1]), 5 (shallow[2]), 84 (shallow[2]); 10 (shallow[3]), 91 (shallow[3])	5
bis(2-ethylhexyl)phthalate	36 (deep[1])	48 (shallow[1]), 26 (shallow[1]), 21 (intermediate[2])	10
2-butanone	18 (shallow[2])	----------	10
chloroethane	----------	43 (intermediate[1]); 110 (shallow[2]), 27(intermediate[2]), 200 (shallow[3]), 93 (shallow[3]) 25 (intermediate[3])	10
ethylbenzene	----------	120 shallow[2]; 88 shallow[3]	5
1,1 dichloroethane	----------	18 (shallow[1])	5
1,1 dichloroethene	----------	57 (intermediate[2]); 18 (intermediate[2]), 28 (deep[2]), 11 (deep[2])	5
trans-1,2-dichloroethane	----------	11 (shallow[1])	5
methylene chloride	----------	16 (shallow[1])	5
trichloroethene	6 (deep[2])	39 (shallow[2]); 6 (deep[2]), 17 (shallow[2]), 190 (intermediate[2]), 26 (deep[2]) 38 (deep[2])	5
toluene	----------	360 (shallow[1]); 12 (intermediate[2]), 18 (intermediate[2]), 5 (deep[2]), 1100 (shallow[2]); 1000 (shallow[3])	5
1,1,1-trichloroethane	----------	15 (shallow[2]), 6 (deep[2]), 18 (intermediate[2]), 9 (deep[2])	5
1,1,1-trichloroethene	8 (deep[2])	----------	5
total xylenes	----------	9 (intermediate[2]), 8 (intermediate[2]), 370 (shallow[2]); 240 (shallow[3])	5
isopropyl alcohol	190 (shallow[2])	120 (shallow[2])	44
sec-butyl alcohol	110 (shallow[2])	----------	47

shallow = contaminant detected in the A1 zone of the Sand & Gravel Aquifer unit
intermediate = contaminant detected in the A2 zone of the Sand & Gravel Aquifer unit
deep = contaminant detected in the A3 zone of the Niagara Aquifer unit
superscript 1 = contaminant detected during the first sampling event (September 25-27, 1987)
superscript 2 = contaminant detected during the second sampling event (March 9 - 11, 1988)
superscript 3 = contaminant detected during the third sampling event (June 28 - July 1, 1988)

Table 2
Inorganic & Metal Contaminants Detected in Groundwater Monitoring Wells
During Remedial Investigation

Inorganic or Metal **Contaminants**	**Up Gradient Concentration (ug/L)**	**Down Gradient Concentration (ug/L)**	**Standard (ug/L)**
aluminum	224 (intermediate[1]), 652 (deep[1])	266 (deep[1]), 203 (shallow[1]), 359 (shallow[1]), 300 (shallow[1]), 387 (intermediate[3]), 244 (shallow[3]), 412 (shallow[3])	
arsenic	----------	16 (shallow[1]), 654 (intermediate[1])	50
barium	649 (intermediate[1])	678 (shallow[1]), 215 (deep[1]), 1190 (shallow[1])	1,000
cadmium	----------	8.2 (shallow[1]), 5.3 (shallow[1]), 9.1 (shallow[1]), 15 (shallow[1]), 9.7 (shallow[1]), 7.1 (intermediate[1])	5
calcium	15,500 to 288,000 (shallow, intermediate, deep)[1,2,3]	13,800 to 276,000 (shallow, intermediate, deep)[1,2,3]	
chromium	5.4 (shallow[1]), 27 (intermediate[1]), 14 (deep[2])	12 to 23 (shallow, intermediate, deep)[1,2,3]	100
copper	54 (shallow[1])	34 (shallow[3])	1,300
iron	253 (shallow[1]), 1500 (shallow[2]), 116 (intermediate[2])	116 to 32,900 (shallow, intermediate)[1,2,3] 125 (deep[1])	300
lead	----------	9.4 (shallow[3])	15
magnesium	7,960 to 44,700 (shallow, intermediate, deep)[1,2,3]	21,400 to 170,000 (shallow, intermediate, deep)[1,2,3]	
manganese	144 (shallow[1]), 105 (shallow[1]), 114 (shallow[2]), 122 (shallow[2]), 123 (shallow[3])	21 to 1,640 (shallow, intermediate, deep)[1,2,3]	50
nickel	----------	40 to 138 (shallow, intermediate)[1,2]	100
potassium	5,810 to 418,000 (intermediate, deep)[1,2,3]	6,140 to 264,000 (shallow, intermediate, deep)[1,2,3]	
sodium	6,240 to 205,000 (shallow, intermediate, deep)[1,2,3]	9,970 to 323,000 (shallow, intermediate, deep)[1,2,3]	

shallow = contaminant detected in the A1 zone of the Sand & Gravel Aquifer unit
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deep = contaminant detected in the A3 zone of the Niagara Aquifer unit
superscript 1 = contaminant detected during the first sampling event (September 25-27, 1987)
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The A1 zone of the sand and gravel system is continuous at the top portion of the aquifer system. At the lower portions of the sand and gravel system the aquifer is discontinuous. These discontinuous portions of the shallow aquifer system comprise the A2 zone and appears to be limited to the southeastern corner of the Site. Although the A2 zone is in the shallow aquifer system, the A2 zone is often referred to as the "intermediate zone". The relationship between the A1, A2 and A3 zones is best described in Figures 2.2.1, and 2.2.

The water-bearing sediments vary in thickness and lateral extent. Contacts between the layers appear to be gradational rather than distinct. The A1 and A2 zones of the shallow aquifer system begin at 15 and 35 feet, respectively, below the ground surface. The A3 zone deep aquifer system begins at approximately 55 feet below the ground surface.

iii. Remedial Investigation (R/I)/Feasibility Study (FS)

In May 1986, the Wisconsin Department of Natural Resources (WDNR) and U.S. EPA reached an agreement (Consent Order) with the Potentially Responsible Parties (PRPs) to perform the RI/FS. The goals of the RI were to identify sources of contamination; to characterize the contamination at the Site; and determine fully the nature and extent of the threat, if any, to the public health or welfare or the environment caused by the release or threatened release of hazardous substances, pollutants, or contaminants from the Site. The goals of the FS were to fully evaluate alternatives for the appropriate extent of remediation, if any, to prevent or mitigate the migration or the release or threatened release of hazardous substances, pollutants, or contaminants from the Site.

The RI/FS work began in 1987. Work included geophysical surveys of the Site, installation and sampling of monitoring wells, sampling of residential wells in the proximity of the Site, evaluation of existing cover materials, collection of surface water and associated sediment samples, and limited air and soil sampling. The investigation included analysis for organics, inorganics, pesticides, polychlorinated biphenyls (PCBs), and general quality indicators. These results were evaluated with regard to existing State and Federal groundwater standards. Groundwater and soil at the Site were contaminated with organic and inorganic compounds. The results were provided within the RI Report. The Final RI also includes a Baseline Risk Assessment which was conducted to characterize the current and potential threat to public health and the environment at the Site. Both the RI and FS were completed in 1990.

II. REMEDY SELECTION

A. Remedial Action Approach

The focus of the Record of Decision (ROD) was Source Control. The ROD required containment of the waste mass with construction of a cap on the Site to prevent infiltration of water through the landfill. In addition, since groundwater was believed to be in direct contact with the waste materials, a groundwater containment system to control the migration of the contaminant plume was required.

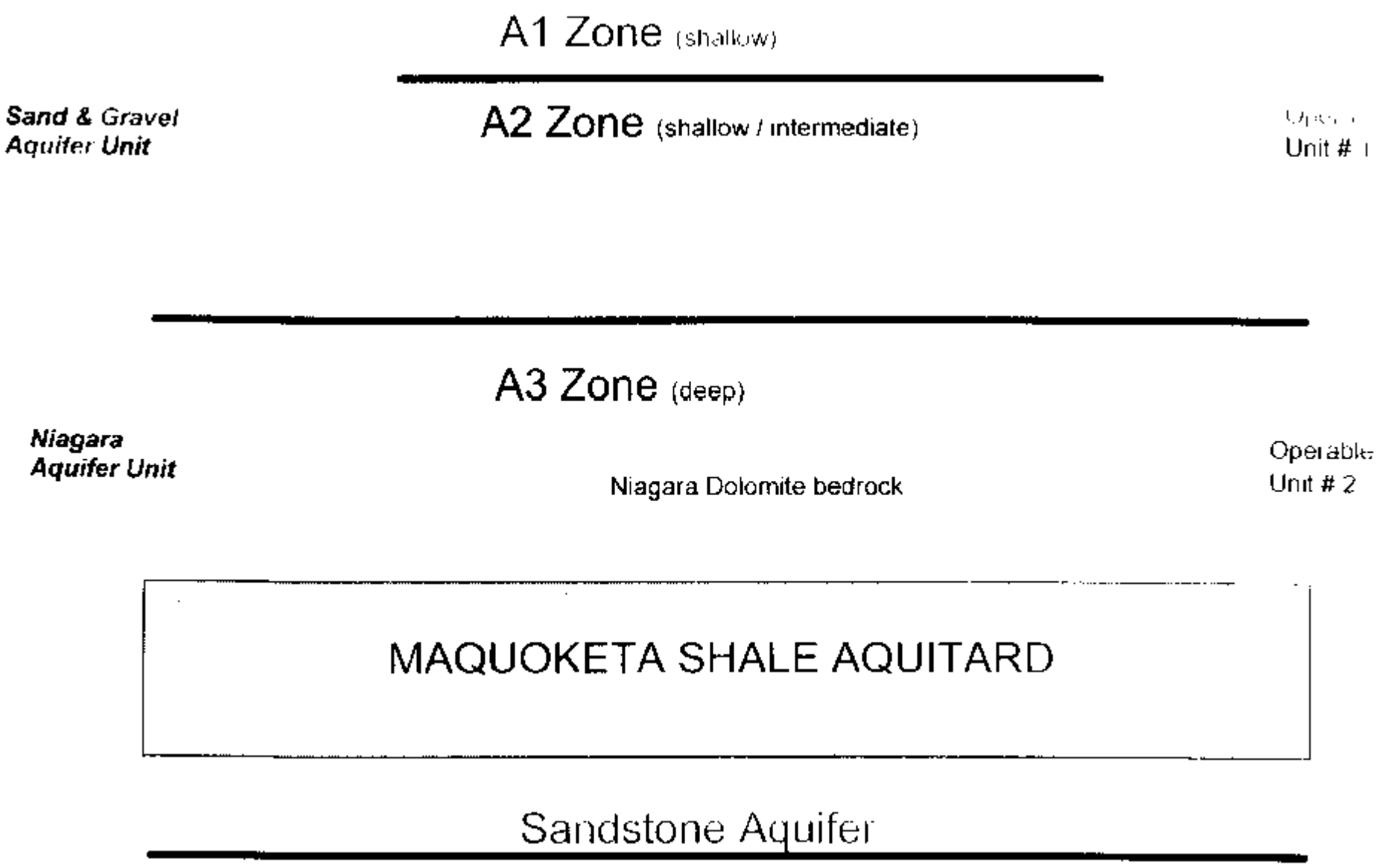
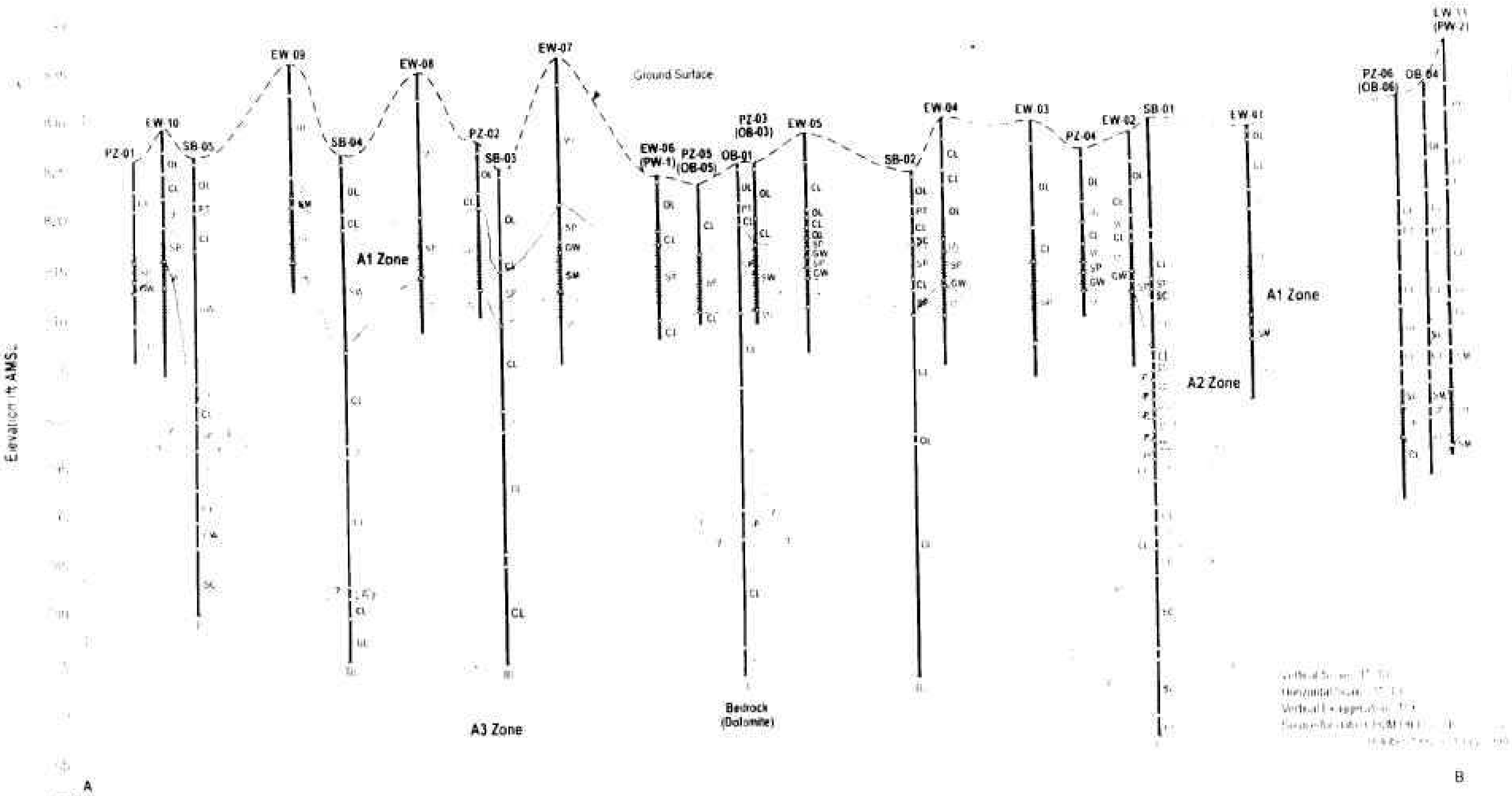


Figure 2. Simplified Diagram of Groundwater Systems at the Master Disposal Service Landfill Site



LEGEND

Water Bearing Sediments

CL CH Clay (CL=Low Plasticity, CH=High Plasticity)

OH OL Organic Clay (OH=High Plasticity, OL= Low Plasticity)
ML MH Silt (ML=Low Plasticity, MH=High Plasticity)
*Also Fill

Silty Sand

Clayey Sand

Well Screen Interval

NOTE: The depth and thickness of the subsurface strata indicated on the section were generalized from and interpolated between test borings. Information on actual subsurface conditions exists only at the specific locations and dates indicated. Soil (rock) conditions and water levels at other locations may differ from conditions occurring at the boring locations.

Geologic Cross-Section Across Face of Groundwater Extraction System

CH2MHILL

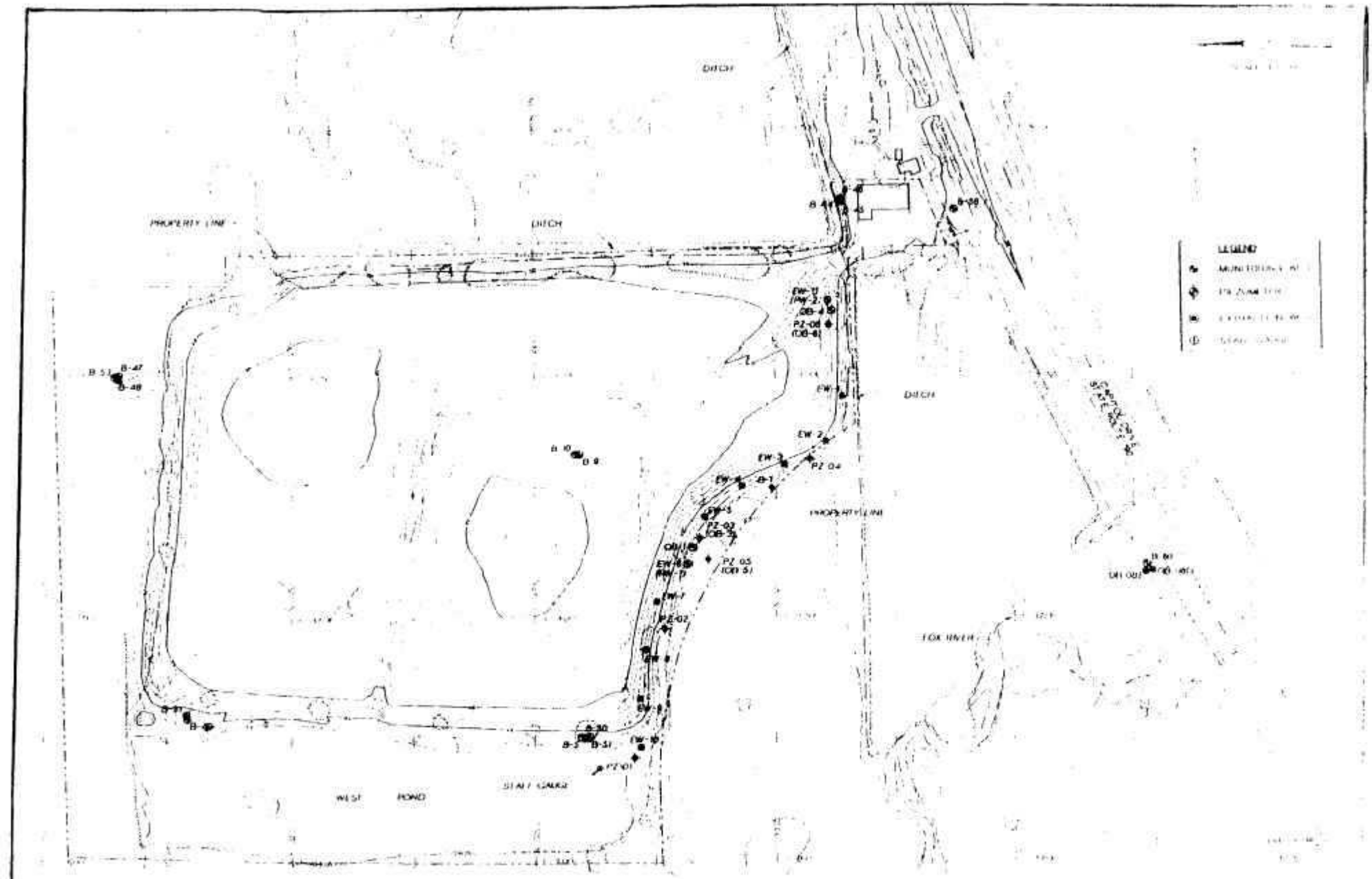


FIGURE 2-2
GROUNDWATER MONITORING NETWORK
MASTER DISPOSAL SERVICE LANDFILL
BROOKFIELD, WISCONSIN

B. Source Control Remediation

On September 26, 1990, the U.S. EPA signed the ROD for the Site denoted as "Source Control Remediation". The goal of the ROD was containment rather than to attain groundwater restoration quality standards. The major components of the selected remedy consisted of the following:

- Placement of a clay/soil cap and an active venting system over the fill material to reduce infiltration into the waste mass (constructed in accordance with NR 504.07 and NR 506.08 Wisconsin Administrative Code):

- Installation of a groundwater extraction and treatment system to remove both organic and inorganic contamination from a portion of the contaminated alluvium aquifer groundwater beneath the Site;

- Conduct groundwater, surface water, water budget/hydrology and wetland monitoring to assess the quality and quantity of area groundwater, surface water and wetlands, and to determine if further mitigating action was needed; and

- Impose access and use restrictions.

The ROD estimated present worth cost for this remedial action ranged from $4,632,000 to $5,016,000, which included an annual O&M cost ranging from $142,730 to $164,130 for 30 years, depending upon the selected groundwater treatment.

C. Remedial Action Goals

The primary goals of the remedial actions at the Site as described in the ROD were: 1) to reduce infiltration into the landfill which is a source of groundwater contaminations and to reduce the risks associated with the exposure to contaminated materials; 2) to contain known contaminated groundwater in the surficial aquifer.

More specifically, the goals were as follows:

To reduce infiltration into waste mass by:

- capping the landfill with clay/soil cap;
- installing a landfill gas venting system; and
- controlling landfill gas as necessary to meet air regulations

To contain contaminated groundwater in the upper aquifer and minimize groundwater extraction impacts on the wetlands by:

- controlling contaminated groundwater in the sand and gravel aquifer unit (A1and A2 zones):
- treating the groundwater to meet the effluent limitations before discharge from the treatment pond;

- discharging the treated water to on-site surface water; and
- delineating wetlands vegetation surrounding the Site and undertaking further monitoring to determine if mitigating action needs to be taken regarding extraction; and, if there were any adverse impacts to the wetlands

To monitor extent of contamination and the effectiveness of the remedy by:

- conducting long-term surface water and groundwater monitoring in the Al, A2, and A3 zones; and
- monitoring wetlands

To limit access to the Site by:

- implementing institutional controls including deed, land use and groundwater use restrictions, and
- implementing Site access restrictions such as fencing

III. REMEDIAL DESIGN (RD) REMEDIAL ACTION (RA) RESPONSE ACTIONS

The legal agreement which embodies the consent of the responsible parties to perform the RD/RA is a Consent Decree. The Consent Decree was entered on January 30, 1992, with 33 parties, the U.S. EPA and the WDNR. On April 14, 1992, U.S. EPA, in consultation with WDNR, approved the RD/RA work plan.

A. Remedial Activities

The major remedy components requiring construction at the Site were soil/clay cover, landfill gas venting system, and a groundwater extraction and treatment system. These systems were constructed between 1994 and 1997. Work at the Site was phased. The cap design proceeded on a faster track than the groundwater design. The cap design was approved in March 1994, and cap construction began in April 1994 and completed by the end of that year. The pre-final inspection occurred on September 20, 1994. A follow-up inspection was conducted on October 25, 1994, which confirmed that the punch list items have been addressed.

The design plans for the groundwater systems were approved in July 1996. The majority of groundwater extraction construction was completed in the fall of 1996, with system start-up occurring in April 1997. Construction was substantially completed by the end of that year. The groundwater monitoring program for the Site was initiated in October 1996. Contaminated Site groundwater is collected and then routed through an on-site pond which will bio-degrade contaminants, and aid in removal of oxygen-demanding substances and ammonia. Treated waters are allowed to seep through wetlands adjacent to the Site. System start-up and operation of the groundwater extraction and treatment system began in April 1997. A final inspection of the groundwater pump and treat system was conducted on May 16, 1997. At that point, long-term groundwater remediation began.

The Construction Completion Report verifies that the construction was accomplished using sound engineering practice and following the guidelines of the WDNR requirements in NR 500

and NR 600 and Wisconsin Administrative Code. Quality assurance tests consistently met or exceeded the criteria established by the WDNR. Also, based on observations, surveys, photographs, and soil analyses, the construction activities for the remediation of the Site were performed in substantial compliance with the "Final Design Submittal, Remedial Design/Remedial Action, for the Source Control Operable Unit of the Master Disposal Landfill Site", and applicable construction design modification approvals.

B. Required Monitoring Programs

I. Types and Frequency

The Consent Decree Scope of Work includes requirements for monitoring the Site in accordance with an approved monitoring plan. The monitoring plan was finalized in July 1996. The data was to be collected in order to serve the following purposes:

- Provide data to confirm the operation of the groundwater extraction system and collection of contaminated groundwater within the lower and intermediate aquifer zones (A1 and A2 zones);
- Monitoring water levels in the wetlands adiacent to the extraction system;
- Collect data to monitor the extraction system's potential effects on wetland vegetation;
- Provide data on the treated discharge;
- Provide additional data on the possible contamination of the deep aquifer zone (A3 zone); and
- Collect landfill gases to determine off-gas flow rates and concentrations and whether they are in compliance with the air regulations.

The sampling and surveys are divided into the following three modules.

Module 1: Groundwater and Wetlands Monitoring Program consisting of 3 components; these are 1) quarterly containment monitoring, 2) quarterly and annual groundwater sampling, and 3) annual vegetation surveys.

Module 2: Extracted Groundwater and Surface Water Monitoring Program consisting of several components; these are pond water level measurements; monthly and quarterly sampling of water samples from extraction wells and discharge pipe.

Module 3: Landfill Gas Monitoring Program, Quarterly landfill gas analyses

Among other requirements, the Consent Decree requires monthly reporting by the PRPs, and submission of a technical memo after the collection of data for two years after extraction systems startup (i.e., April 1997). At that point, the PRPs are allowed to petition for reduction in sample collection frequency.

i. Standards of Comparison of Remedial Objectives

Sample analytical results for the groundwater shallow, intermediate, and deep aquifer zones are compared to the Wisconsin Administrative Code Chapter NR 140 Enforcement Standard and the Preventative Action Limit (PAL) for each constituent. The Enforcement Standards and PALs are the State regulatory criteria to assess the quality of water. These are at least as stringent as the Federal standards know as the Maximum Contaminant Levels (MCLs). However, in most cases, they are more stringent.

Sample analytical results from extracted groundwater and surface water monitoring program are used to demonstrate compliance with the substantive requirements of the Wisconsin Pollutant Discharge Elimination System (WPDES). Effluent discharge limitations for treated groundwater are calculated from State discharge statutes, and specified weekly averages for metal contaminants and monthly averages for VOCs, as well as maximum concentration levels. Chemical-specific goals include benzene--8.5 lbs/day, TCE-22 lbs/day, toluene (daily concentration level)--l7 mg/l, arsenic-0.045 lbs/day, chromium (total)--0.034 lbs/day, and lead--0.0096 lbs/day.

The landfill gas from the passive venting system was sampled to determine if the mass emission rates of several constituents in the landfill gases exceeded the regulatory levels found in the applicable provisions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) and Wisconsin Administrative Code Chapter NR 445. In addition, methane and non-methane organic carbon were analyzed as general indicator parameters.

ii. Chemical Analysis Required

The following volatile organic and inorganic compounds have been identified as contaminants of concern in the ROD: methylene chloride; 1,1 dichloroethene; trichloroethane; benzene; toluene; xylene; arsenic; cadmium; chromium; copper; lead; iron; nickel; and, zinc. These compounds are monitored as part of the list of priority pollutants consisting of 34 organics, 25 inorganics, cyanide, PCB 1248, and bis(2-ethylhexyl)phthalate, pH, temperature, specific conductivity, and redox potential. Water levels measurements are also taken. The goal of the monitoring program is to detect changes in chemical concentration and hydrologic characteristics in groundwater at the Site.

IV. REMEDY PERFORMANCE / AREAS of NONCOMPLIANCE

A. Site Monitoring Results

Since October 1996, and as of March 2000, the following monitoring events have occurred: three annual groundwater and wetlands monitoring events, 4 annual vegetation surveys, 13 quarterly groundwater sampling events, 4 landfill gas events, and 19 monthly surface water (pond) monitoring events, and 9 quarterly bioassays in the surface water (pond).

Annual monitoring of the Sand and Gravel Aquifer unit (A1 and A2 zones) was performed to assess the effectiveness, of the landfill cap and groundwater capture by the extraction well system. (Groundwater monitoring results are presented in Tables 3 and 4). From these monitoring events, VOCs exceeded the Wisconsin PALs during two occasions, but did not exceed the Wisconsin's Enforcement Standards. This will continue to be monitored on an annual basis.

Monitoring the Niagara Dolomite Aquifer unit (A3 zone) for 13 quarters produced one detected constituent exceeding Wisconsin PALs & Enforcement Standards that could not be attributed to background or laboratory contamination.

Groundwater elevation measurements of the sand and gravel aquifer unit indicated that the groundwater extraction system is effectively capturing the contaminated groundwater in that unit. Maintenance of the extractions system and refinements to the groundwater level monitoring program are being examined at this point.

Landfill gas was sampled for four quarters and all gas emissions were determined to be well within the air regulations.

Treatment pond surface water chemical and bioassay monitoring results showed no signs of exceedance of discharge limits. Monitoring has been followed to meet the substantive requirements of the Wisconsin Pollutant Discharge Elimination System program.

Based upon groundwater elevation information, the groundwater extraction system affects only a very narrow part of the wetlands along the landfill's southern edge.

Two vegetation surveys of wetland communities have occurred since 1997. Some changes in plant community parameters, such as dominant species, have occurred during the survey period. In several areas of the wetlands, some fluctuation in water levels has been documented which may be seasonal in nature. In addition, the composition and structure of wetland plant communities has changed in several areas of the Site. In particular, wetland areas nearest the extraction wells are dominated by a dense cover of reed canary grass. This species is very aggressive and can dominate other wetland plants. As a result, a shift towards a monotypic stand with a lower plant diversity may be occurring in these areas of the Site. In contrast, in other areas, communities are more wooded and contain a greater diversity of ground cover species. It has not yet been determined if the changes occurring in the wetlands are adversely affecting the wetlands.

TABLE 3

Niagara Dolomite Aquifer Unit – Constituents Exceeding Wisconsin Preventative Action Limits (PALS) or Enforcement Standards (ESs) During Quarterly and Annual Monitoring October 1996 through October 1999

Monitoring Well #	Constituent	Frequency of PAL Exceedance	Sample Date of PAL Exceedance	Concentration of PAL Exceedance (ug/L)	PAL (ug/L)	Frequency of ES Exceedance	Concentration of ES Exceedance (ug/L)	ES (ug/L)
B-43	Iron	2 of 4	10/02/97	281J	150	1 of 4	--	300
			10/20/99	1540	150		1540	300
	Manganese	1 of 1	10/20/99	44.2	25	0 of 1	--	50
B-46	Antimony	2 of 13	07/08/97	21.8B	1.2	2 of 13	21.8B	5
			07/15/98	9.9B	1.2		9.9B	5
	Cadmium	1 of 13	07/08/97	1.2J	0.5	0 of 13	--	5
	Manganese	13 of 13	All	Avg. =27.9	25	0 of 13	--	50
	Phthalate	1 of 13	10/07/96	11B	0.6	1 of 13	11B	6
B-48	Antimony	4 of 13	07/09/97	22.5B	1.2	4 of 13	22.5B	6
			07/16/98	13.8B	1.2		13.8B	6
			10/16/98	12.2B	1.2		12.2B	6
			04/22/99	12	1.2		12	6
	Arsenic	13 of 13	10/08/96	9.4B	5	0 of 13	--	50
			01/07/97	10.2	5		--	50
			04/08/97	9.6J	5		--	50
			07/09/97	10.8	5		--	50
			10/02/97	9.9J	5		--	50
			01/06/98	7.7J	5		--	50
			04/14/98	10.9	5		--	50
			07/16/98	10.1	5		--	50
			10/16/98	9.9J	5		--	50
			01/20/99	10.8	5		--	50
			04/22/99	10.8	5		--	50
			07/20/99	7.2	5		--	50
			10/21/99	10J	5		--	50
B-51	Antimony	3 of 13	04/08/97	17.8B	1.2	3 of 13	17.8B	6
			07/09/97	22.7B	1.2		22.7B	6
			10/15/98	15.1B	1.2		15.1B	6
	Cadmium	1 of 13	07/09/97	24.8	0.5	1 of 13	24.8	5
	Iron	3 of 13	04/15/98	161	150	1 of 13	--	300
			07/22/99	289	150		--	300
			10/20/99	324	150		324	300
B-56	Antimony	6 of 13	04/07/97	17B	1.2	6 of 13	17B	6
			07/09/97	23.6B	1.2		23.6B	6
			01/06/98	18.8J	1.2		18.8J	6
			04/13/98	14J	1.2		14J	6
			07/16/98	10B	1.2		10B	6
			10/14/98	9.1J	1.2		9.1	6
	Arsenic	2 of 13	01/07/97	5.2J	5	0 of 13	--	50
			10/20/99	6J	5		--	50
	Phthalate	2 of 13	10/10/96	18B	0.6	2 of 13	18B	6
			01/07/97	57	0.6		57	6
OB-08D	Antimony	9 of 13	04/07/97	21B	1.2	9 of 13	21B	6
			07/08/97	30B	1.2		30B	6
			10/01/97	14.3J	1.2		14.3J	6
			01/06/98	18.2J	1.2		18.2J	6
			07/15/98	21.5B	1.2		21.5B	6
			10/14/98	12.5J	1.2		12.5J	6
			07/22/99	18.5	1.2		18.5	6
			01/19/99	13.8B	1.2		13.8B	6
			10/20/99	12.4J	1.2		12.4J	6
	Iron	6 of 13	04/07/97	616	150	6 of 13	616	300
			10/01/97	394J	150		394J	300
			01/06/98	1290J	150		1290J	300
			04/14/98	606	150		606	300
			07/22/99	2800	150		2800	300
			10/20/99	2820	150		2820	300
	Manganese	13 of 13	All	Avg. = 66.5	25	12 of 13	Avg. = 69.1	50
	Phthalate	1 of 13	10/08/96	14B	0.6	1 of 13	14B	6
	Thallium	1 of 13	01/19/99	0.6	0.4	0 of 13	--	2
OB-09D	Antimony	6 of 13	10/08/96	15.7B	1.2	6 of 13	15.7B	6
			04/07/97	28.8B	1.2		28.8B	6
			07/08/97	29.2B	1.2		29.2B	6
			07/15/98	11.2B	1.2		11.2B	6
			10/14/98	12.3J	1.2		12.3J	6
			01/19/99	12.1B	1.2		12.1B	6
	Iron	7 of 13	10/08/96	164	150	6 of 13	--	300
			04/07/97	1760	150		1760	300
			10/01/97	627J	150		627J	300
			01/07/98	455	150		455	300
			04/14/98	1060	150		1060	300
			07/22/99	321	150		321	300
			10/20/99	349	150		349	300
	Lead	1 of 13	07/08/97	1.5B	1.5	0 of 13	--	15
	Manganese	13 of 13	All	Avg. = 173	25	13 of 13	Avg. = 173	50
	Phthalate	1 of 13	07/08/97	370	0.6	1 of 13	370	6

"B" indicates that the reported result may be due to sample contamination as indicated by lab or field blank results.
"J" indicates that the reported result is estimated.

TABLE 4

Sand and Gravel Aquifer Unit – Constituents Exceeding Wisconsin Preventative Action Limits (PALs) or Enforcement Standards (Ess) During Quarterly and Annual Monitoring October 1996 through October 1999

Monitoring Well #	Constituent	Frequency of PAL Exceedance	Sample Date of PAL Exceedance	Concentration of PAL Exceedance (ug/l)	PAL (ug/l)	Frequency of ES Exceedance	Concentration of ES Exceedance (ug/l)	ES (ug/l)
B-01	Benzene	4 of 4	All	Avg. = 1.5	0.5	0 of 4	--	5
	Iron	4 of 4	All	Avg. = 6506	150	4 of 4	Avg. = 6506	300
	Nickel	4 of 4	All	Avg. = 27	20	0 of 4	--	100
B-05	Arsenic	2 of 3	10/02/97	23.3	5	0 of 3	--	50
			10/21/99	26	5		--	50
	Iron	1 of 3	10/21/99	251	150	0 of 3	--	300
B-09	Iron	3 of 3	All	Avg. = 3238	150	3 of 3	Avg. = 3238	300
	Nickel	3 of 3	All	Avg. = 48.1	20	0		100
B-31	Benzene	3 of 4	11/25/96	2	0.5	0 of 4		5
			10/01/97	2	0.5		--	5
			10/21/99	1	0.5		--	5
	Iron	4 of 4	All	Avg. = 3843	150	3 of 4	Avg. = 5053	300
B-44	Iron	2 of 4	10/15/98	239	150	1 of 4	--	300
			10/21/99	512	150		512	300
B-45	Arsenic	4 of 4	All	Avg. = 8.7	5	0 of 4	--	50
B-47	Iron	4 of 4	11/25/96	1440	150	3 of 4	1440	300
			10/02/97	1200J	150		1200	300
			10/16/98	166	150		--	300
			10/21/99	4160	150		4160	300
B-49	Arsenic	4 of 4	11/25/96	6.7J	5	0 of 4	--	50
			10/01/97	6.6B	5		--	50
			10/16/98	5.9J	5		--	50
			10/21/99	10.1	5		--	50
	Nickel	2 of 4	10/16/98	26.4	20	0 of 4	--	100
			10/21/99	26	20		--	100
B-53	Iron	3 of 4	11/25/96	2800	150	3 of 4	2800	300
			10/02/97	551J	150		551	300
			10/21/99	1940	150		1940	300
OB-07S	Arsenic	9 of 13	10/09/96	8.9B	5	0 of 13	--	50
			01/07/97	5.2J	5		--	50
			04/08/97	5.8J	5		--	50
			07/09/97	6.4J	5		--	50
			10/02/97	8.5J	5		--	50
			01/07/98	6.9J	5		--	50
			04/15/98	7.6J	5		--	50
			07/21/99	11.4	5		--	50
			10/20/99	16.1	5		--	50
	Iron	9 of 13	10/09/96	729	150	9 of 13	729	300
			01/07/97	489	150		489	300
			04/08/97	2410	150		2410	300
			07/09/97	873J	150		873	300
			10/02/97	2500J	150		2500	300
			01/07/98	2660	150		2660	300
			04/15/98	2530	150		2530	300
			07/21/99	3570	150		3570	300
			10/20/99	3850	150		3850	300
	Nickel	1 of 10	10/09/96	165	20	1 of 10	165	100
OB-071	Iron	7 of 13	10/09/96	3250	150	6 of 13	3250	300
			04/08/97	1220	150		1220	300
			10/02/97	181J	150		--	300
			01/07/98	1400	150		1400	300
			04/15/98	850	150		850	300
			07/21/99	2610	150		2610	300
			10/20/99	3850	150		3850	300
	Nickel	1 of 13	10/09/96	78	20	0 of 13	--	100
OB-081	Iron	4 of 13	10/08/96	881	150	3 of 13	881	300
			01/06/98	171B	150		--	300
			07/21/99	2330	150		2330	300
			10/20/99	2260	150		2260	300
	Lead	1 of 13	07/08/97	2B	1.5	0 of 13	--	15
	Thallium	1 of 1	01/19/99	0.83J	0.4	0 of 1	--	2

"B" indicates that the reported result may be due to sample contamination as indicated by lab or field blank results.
"J" indicates that the reported result is estimated.

B. Future Monitoring

The PRPs have submitted a two year evaluation technical memorandum dated May 6, 1999, which summarizes results from the monitoring and makes recommendations for reducing monitoring for several of the sampling regimes. U.S. EPA has reviewed the technical memorandum and has decided that a reduced monitoring program is appropriate for this Site at this time. Further monitoring and investigation will supplement information on this matter and will also be addressed as part of the recommendations for this 5-year review.

C. Summary of Site Visits

On June 27, 2000, a Site visit was conducted to determine the conditions at the Site. This visit was performed by Lolita Hill of the U.S. EPA Mike Jury of CHM2 HILL, and Amanda Holman of CH2M HILL. The following Site conditions were observed and noted:

* The groundwater extraction system was operating properly;
* The cap was recently mowed and adequately maintained with no visible signs of erosion or ponding; and
* Beavers built a dam on the southeast side of the landfill. This dam has the potential to raise the water level to the east of the landfill.

The PRPs have conducted monthly maintenance inspections along with the chemical monitoring. These are documented in the monthly progress reports. Necessary maintenance activities have occurred as needed. Examples of the system maintenance activities are as follows: inspection of pumps and level transducers; inspection of discharge pile, chlorination to address bio-fouling; re-calibration/replacement of equipment as needed; and installation of valve on discharge line for sampling.

D. ARARs

The remedy performed at the Site complies with the performance standards selected in the ROD. These standards remain protective of human health and the environment.

Based upon the Construction Completion Report and the observations made during the Site inspections, U.S. EPA believes that the landfill cap and extraction system are fully adequate to protect against inhalation, ingestion and direct contact with the landfill materials, to prevent landfill materials from eroding and migrating off-site, and to prevent significant amounts of water from infiltrating, into the landfill.

The deed restrictions and Site controls that prevent access, excavation, and disturbance of the cap or installation of wells are in place.

In summary, the Source Control remedial action provides protection of groundwater and exposure to soil contamination by reducing the risks posed by the Site, through engineering and institutional controls. These remedial actions are completed, and the goals for these actions have been achieved.

V. RECOMMENDATIONS

1. PRPs will continue operation and maintenance of the groundwater extraction system, including the extraction wells and discharge piping network.

2. U.S. EPA and PRPs will continue evaluating the effectiveness of extraction wells and systems in place to ensure that the remedy is most efficient at containing contaminants on-site and to prevent migration of contaminants off-site. Also, to determine if expansion of the system is necessary.

3. U.S. EPA and the PRPs will continue to evaluate data collected at the Site.

4. U.S. EPA will evaluate the need for continuing the annual vegetation survey.

VI. STATEMENT OF PROTECTIVENESS

The remedy selected for this Site remains protective of human health and the environment. The remedial actions appear to be operating as described in the ROD for Source Control. Both on-site and off-site conditions are going to be evaluated as described in the Recommendations section of this review report, in order to ensure that there are no additional actions are needed. The evaluation will also focus on available options for optimizing remedy performance. No residents have been impacted by off-site groundwater contamination. A monitoring program has been implemented to monitor fate, transport and effectiveness of the groundwater capture and treatment system.

VII. NEXT FIVE YEAR REVIEW

The initiation of the remedial activities at the Site occurred in March of 1994. The next five year review will be conducted by March 2004, which is ten years from the initiation of remedial action construction activities at the Site.

William E. Muno, Director
Superfund Division

Sept. 25, 2000
Date

BIBLIOGRAPHY

U.S. Environmental Protection Agency, "Source Control Operable Unit Record of Decision for the Master Service Disposal Landfill". September 26, 1990.

CH2MHill, "Master Disposal Service Landfill; Agency Review Draft, Two Year Evaluation Report and Summary". May 1999.

"Superfund Preliminary Close-Out Report", Master Disposal Service Landfill. June 19, 1997.

"PRP Workplan; Remedial Investigation/Feasibility Study", Master Disposal Service Landfill, Technical Scope of Work, February 21, 1996.

U.S. EPA Region V, Administrative Order By Consent, In the Matter of Master Disposal Service Landfill, Respondents, V-W-86-C-007, May 1986.

Consent Decree, United States of America, and the State of Wisconsin v. Brake, Clutch & Drum, et. Al.

The Earth Technology Corporation, "Remedial Investigation Report for the Master Disposal Disposal Service Landfill". June 18, 1990.

The Earth Technology Corporation, "Feasibility Study Report for the Master Disposal Disposal Service Landfill". January, 1990.